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COLONEL TIMOTHY P. ALBEN SUPERINTENDENT

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Tovensio and Technology Center 1.24 Abeton Street Naymard, MA 01754 Tel 978 451 3300 Fax 978 451 3401

DNA-STR COMPREHENSIVE REPORT

I. Case Information

Laboratory Number: 13-08140 Watertown

Incident Number: 2013-110-0147

Report To: Trooper Michael Cashman, MSP Middlesex County Detective Unit

cc: ADA Adrienne Lynch, Middlesex County District Attorney's Office

Susan Ledoux, Middlesex County District Attorney's Office

Case Type: Fatal Investigation Date of Incident: 4/18/2013

Victims: Richard Donohue, Jr.

Sean Collier Dun Meng

Suspects: Dzhokhar Tsamaev

. Tamerlan A. Tsarnaev

II. Results

STR (Short Tandem Repeat) Data

The DNA samples were extracted and amplified using Applied Biosystems AmpFISTR Profiler Plus™, COfiler™ and/or Identifiler™ kits and electrophoresed on an ABI 310 or ABI 3130xI genetic analyzer for STR fragment analysis. Profiler Plus™ and COfiler™ kits are utilized to profile 13 genetic loci plus Amelogenin (sex indicator). The AmpFISTR Identifiler™ kit is utilized to profile 15 genetic loci plus Amelogenin (sex indicator). The genetic loci for the kits are outlined in the results tables.

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Date: April 22, 2013 MSPCL Analyst: Jennifer S. Montgomery

MSFCL Lab Number: 13-07864 Boston MSFCL Batch Number: MEX2013-0050 Batch File Reviewer: KAB2

তিত্তুপোত্তীত্র শিত্তথাতি Table Exemplar Sample: Allele Types in Repeat Units

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MA .	17
0198433	. 15
D19	14
Case # Mem #	13-07864 15-1.1
Sample Description	KSS- Tamerlan A. Tsamaev

Keyr KSS = Known Saliva Standard

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Date: April 26, 2013

MISPCL Analyst: Jennifer S. Montgomery

MSPCL Lab Number: 13-08091 Cambridge MSPCL Eatch Number: MEX2013-0051 Entch File Reviewer: KAB2

Identiffler^{TR} Recults Table Exemplar Samples: Allele Types in Repeat Units

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Case# Tiene#	13-08091 10-4.1	13-08091 12-1.1.1
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Case # Item #	13-08091 10-4.1	13-08093		
Sample Description	HHS- Sean Collier	KBS- Dzhokhar Tsarnaev		

KBS = Known Blood Standard Key: HHS = Head Hair Standard Page 3 of 8

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identifiler Results Table Questioned Samples: Allele Types in Repeat Units

D2S1338		W. W.
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D3S1179	. 13	(주) (전) (건)
Case #	13-08140	13-08140
Sample Beschiven	Swab of red-brown stains on exterior palmar side of right glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7)	Swab of red-brovn, stains on exterior dorsal side of pinky of left glove recovered from driver side front floor area (Honda Civic MA Reg. 115GC7)

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EGA	20 22 .		
D58818	. 12 . 12	전 . r=1	
TOUT Y		. ≥1 . ≥4	
D18851	15. 20	15.20	
MOM	10 11	1	t = minor alleles
VW.	. 15 17	12-1 160 11	VEX. 1-5 Collisions fort = maior allelets / emallar font = minor allelets
D198433	14	ह्य : ह्य स्य	font = major alle
Cace #	13-08140	13-03140	Tall Targe
Sample Description	Swab of red-brown stains on exterior painner side of right glove recovered from drover side from Bover urea (Honda Civic M.A. Reg. 116GC7)	Swablof_cd-brown stains on exterior dorsalisade of pinicy of left glove recovered from driver side from thonda Civic W. Reg. 116GCT)	KT4.

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Identifiler II Results Table Questioned Samples: Allele Types in Repeat Units

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CSRIPO	* 10 11 12 13	* 10 11 12		D18851	14 15 * * 19 *		= major allele(s) /	Page 5 of 8
D78820	* 9 10 * 12	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		MOAL		69 	I.D, large font	
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D\$S1179	° 12 13 14 15	12 60 14		D198433	* 14.15	: 2.	lele below thresh	ot be cimerentiate Watertown
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ं डिक्राम्बान्ति डिक्राम्बान्ति	Swab/scrapings of interior palmar side of right glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC?)	Swab/scrapings of interior palmar side of thumb, index, middle, and ring fingers of lert glove erecovered from driver side from floor area (Florda Civic MA Reg. 116GC7)		Sample Description	Swab/scrapings of interior palmar side of right glove recovered from driver side front floor, area (Flonda Civic MA Regi 116GC7)	Swab/scrapings of interior palmar side of thumb, index, middle, and rains—recovered front, diver side front, floor area (Honda Civic MA—Reg. 116GC7)	KEX.	
	Cace # DeSil79 D21S11 D7S20 CSRIPO D3S1358 TH01 D13S317 D16S539	Case # DeSil79 DeSil179 Desil179 Desil179 Desil20 CSRIPO Desil25 The Desil27 Diess317 Diess32 13-08140 * 12 13 14 15 * 30 31 31.2 * * 910 * 12 * 10 11 12 13 14 15 16 67 8 9 9.3 8 10 11 12 * "10 11 12 *	Description	Cace # D6S1179 D21S11 D7S20 CSFIPO D3S1358 THGI D13S317 D16S539 13-06140 *12131415 *3031312 * *910 *12 *10111213 141516 678993 8101112 *101112 * 13-06140 121315 293031 81012 *1012 1011121 1011121 13-06140 121315 31.2 * 81012 *1012 101112 1011121 13-06140 121315 31.2 * 81012 *1012 1011121 13-06140 121315 31.2 * 81012 *10112 1011121 13-06140 121315 31.2 * 810112 101112 13-06140 121315 31.2 * 810112 101112 13-06140 121315 31.2 * 810112 101112 13-06140 121315 31.2 * 810112 101112 14-16	Description Description	12-05140 12-13-14 15 14-15 14-15 14-15 15-15 1	13-03140 12131415 3031312	Design Design Design Dries D

III. Conclusions

 Swab of red-brown stains on exterior palmar side of right glove recovered from driver side front floor area (Monda Civic MA Reg. 116GC7), Item # 12-9.1.1;

The DNA profile obtained from this item matched the DNA profile from Scan Collicr, and did not match the DNA profiles from Tamerlan A. Tsarnaev and Dzhokhar Tsarnaev.

On the basis of the above results, the following conclusions may be drawn:

A. Sean Collier (Case # 13-08091, Item # 10-4.1) could have been the source of the male DNA identified on this item. Results were obtained for the genetic loci D8S1179, D21S11, D7S820, CSF1PO, D3S1358, TH01, D13S317, D16S539, D2S1338, D19S433, vWA, TPOX, D18S51, Amelogenin, D5S818 and FGA. (Note: Amelogenin, D2S1338 and D19S433 are not utilized in the statistical calculation of probability.) The probability of a randomly selected unrelated individual having a DNA profile matching that obtained from this item is approximately:

Population		
Caucasian	1 in 1,668,000,000,000,000,000	1 in 1.668 quintillion
African American	1 in 121,000,000,000,000,000	1 in 121.0 quadrillion
Hispanic	1 in 700,800,000,000,000,000	1 in 700.8 quadrillion
Asian	1 in 5,371,000,000,000,000,000	1 in 5.371 quintillion

- B. Tamerlan A. Tsarnaev (Case # 13-07864, Item # 15-1.1) and Dzhokhar Tsarnaev (Case # 13-08091, Item # 12-1.1.1) could not have been the source of the male DNA identified on this item.
- Swab of red-brown stains on exterior dorsal side of pinky of left glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7), Item # 12-9.3.1:

The DNA profile obtained from this item indicated the presence of a mixture of DNA from more than one source. The major source of the DNA from this item has been interpreted, and this major male DNA profile matched the DNA profile from Sean Collier, Tamerlan A. Tsarnaev and Dzhokhar Tsarnaev are excluded as the source of the major profile in this DNA mixture.

On the basis of the above results, the following conclusions may be drawn:

A. Sean Collicr (Case # 13-08091, Item # 10-4.1) could have been the source of the major male DNA identified on this item. Results were obtained for the genetic loci D8S1179, D2IS11, D7S820, CSFIPO, D3S1358, TH01, D13S317, D16S539, D2S1338, D19S433, vWA, TPOX, D18S51, Amelogenin, D5S818 and FGA. (Note: Amelogenin, D2S1338 and D19S433 are not utilized in the statistical calculation of probability.) The probability of a randomly selected unrelated individual having a DNA profile matching that obtained from this item is approximately:

Population	·	
Cancasian `	1 in 1,668,000,000,000,000,000	I in 1.668 quintillion
African American	I in 121,000,000,000,000,000	1 in 121.0 quadrillion
Hispanic	1 in 700,800,000,000,000,000	1 in 700.8 quadrillion
Asian	1 in 5,371,000,000,000,000,000	1 in 5.371 quintillion

B. Tamerlan A. Tsarnaev (Case # 13-07864, Item # 15-1.1) and Dzhokhar Tsarnaev (Case # 13-08091, Item # 12-1.1.1), could not have been the source of the major male DNA identified on this item.

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 Swab/scrapings of interior palmar side of thumb, index, middle, and ring fingers of left glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7), Item # 12-9.6.1:

The DNA profile obtained from this item is a mixture of DNA from at least two individuals. Tamerlan A. Tsarnaev matched the major profile in this DNA mixture. Sean Collier and Dzhokhar Tsarnaev are excluded as the source of the major profile in this DNA mixture. The minor DNA profile obtained from this item yielded inconclusive results for comparison with Sean Collier and Dzhokhar Tsarnaev.

On the basis of the above results, the following conclusions may be drawn:

A. Tamerlan A. Tsarnaev (Case # 13-07864, Item # 15-1.1) could have been the source of the major male DNA identified on this item. Results were obtained for the genetic loci D8S1179, D2IS11, D7S820, CSF1PO, D3S1358, TH01, D13S317, D16S539, D2S1338, D19S433, vWA, TPOX, D18S51, Amelogenin, D5S818 and FGA. (Note: Amelogenin, D2S1338 and D19S433 are not utilized in the statistical calculation of probability.) The probability of a randomly selected unrelated individual having a DNA profile matching that obtained from this item is approximately:

Population		
Caucasian	1 in 3,465,000,000,000,000	1 in 3.465 quadrillion
African American	1 in 318,400,000,000,000,000	1 in 318.4 quadrillion
Hispanic	1 in 3,630,000,000,000,000 .	1 in 3.630 quadrillion
Asian	1 in 39,370,000,000,000,000	1 in 39.37 quadrillion

- B. Sean Collier (Case # 13-08091, Item # 10-4.1) and Dzhokhar Tsarnaev (Case # 13-08091, Item # 12-1.1.1) could not have been the source of the major male DNA identified on this item.
- 4. Swab/scrapings of interior palmar side of right glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7), Item # 12-9.5.1:

The DNA profile obtained from this item is a mixture of DNA from at least three individuals. Tamerlan A. Tsarnaev and Dzhokhar Tsarnaev are included as potential contributors in this DNA mixture. The DNA profile obtained from this item yielded inconclusive results for comparison with Sean Collier.

On the basis of the above results, the following conclusions may be drawn:

A. Tamerlan A. Tsarnaev (Case # 13-07864, Item # 15-1.1) and Dzhokhar Tsarnaev (Case # 13-08091, Item # 12-1.1.1) could have been potential contributors of the DNA identified on this item.

IV. Additional Comments

- 1. The probability estimates were calculated using the Federal Bureau of Investigation's published databases:
 - A. (Budowle B, Moretti TR, Baumstark AL, Defenbaugh DA, Keys KM. Population data on the thirteen CODIS core short tandem repeat loci in African Americans, U.S. Caucasians, Hispanics, Bahamians, Jamaicans, and Trinidadians. J Forensic Sci 1999;44(6):1277-1286). (African American and Caucasian)
 - B. (Budowle B, Shea B, Niezgoda S, Chakraborty, R. CODIS STR loci data from 41 sample populations. J Forensic Sci 2001:46;(3):453-489). (Southeast Hispanic and General Asian)
- 2. Point estimates were calculated using Recommendation 4.1 contained within The Evaluation of Forensic DNA Evidence, National Research Council, 1996. For these calculations, the value of theta is 0.03.
- 3. The questioned DNA profile (Item # 12-9.6.1, major profile) generated in this case will be searched against the Convicted Offender Index and/or uploaded to a searchable DNA profile database (SDIS State DNA Index

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System and NDIS - National DNA Index System). The MSP Crime Laboratory will make contact with the District Attorney's Office and Investigator in the event of a profile match to a database profile.

- 4. Extraneous DNA may be present on common articles such as clothing, shoes, etc. This extraneous DNA often manifests itself as a low level minor contributor in a DNA result, and may have no probative value in a case. For such samples, only the major contributor may be interpreted.
- 5. At least 50% of the raw material has been retained for independent analysis, unless the laboratory received written authorization for exhaustive testing. DNA extracts will be retained at the laboratory.
- 6. Further statistical calculations can be made if necessary and requested.
- 7. If further analysis is required, please contact the Case Management Unit at (978) 451-3440.

Note: Further comparative analysis requires the submission of the appropriate standards.

V. Signature

This report reflects the test results, conclusions, interpretations, and/or the findings of the analyst as indicated by the signature below.

Assigned DNA Analyst Jennifer S. Montgomery

4/29/13

Date

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